

# Blue Ribbon Service

Form GSS-1291

International®  
Cub® Cadet Tractor  
Chassis

File in Tractor Service Manual

INTERNATIONAL HARVESTER COMPANY  
180 NORTH MICHIGAN AVE. CHICAGO 1, ILLINOIS

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## INTRODUCTION

This manual covers the servicing procedures of all the chassis components of the International Cub Cadet tractor. The engine, fuel system and ignition system are covered in Blue Ribbon Service Manual GSS-1292 (also the electrical system when so equipped).

# GENERAL INFORMATION

The Cub Cadet (Illust. 1) is powered by a seven horsepower, four cycle, gasoline air cooled engine.

The tractor is driven by a "V" belt which connects the engine to a friction type clutch. The reduction drive, connecting the clutch to the transmission, transmits power to the rear wheels through the transmission and differential. The transmission provides three speeds forward and one reverse.

Tractors equipped with electric starting have a combination generator and cranking motor. With this type of unit, it is un-

necessary to polarize the electrical system whenever a component is replaced as the system is automatically polarized when the starter button is pressed.

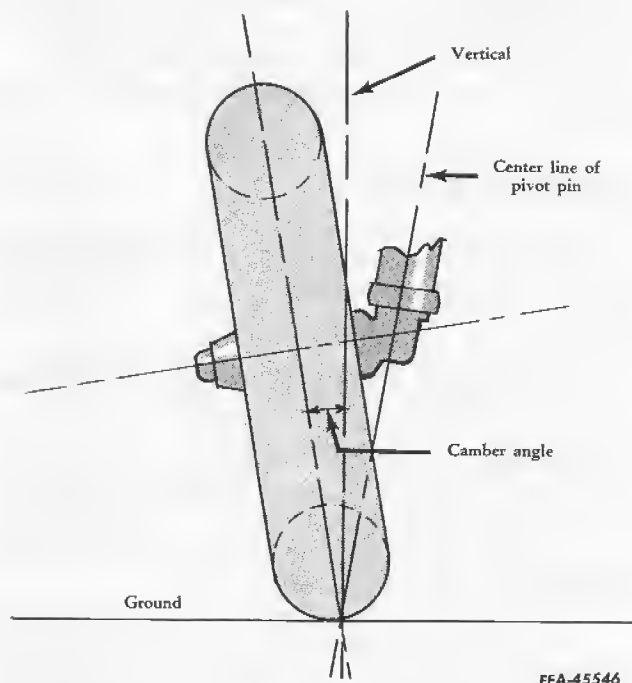
## Factors Affecting Steering

Several things are built into the tractor to make steering easier. Some of them are not adjustable; you can do nothing about them. Understanding the design will, however, help you to analyze causes of steering problems. The following brief explanations and sketches illustrate these things.



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Illust. 1. Left side view.



FEA-45546

Illust. 2. Built-in camber angle as seen from the front of the tractor.

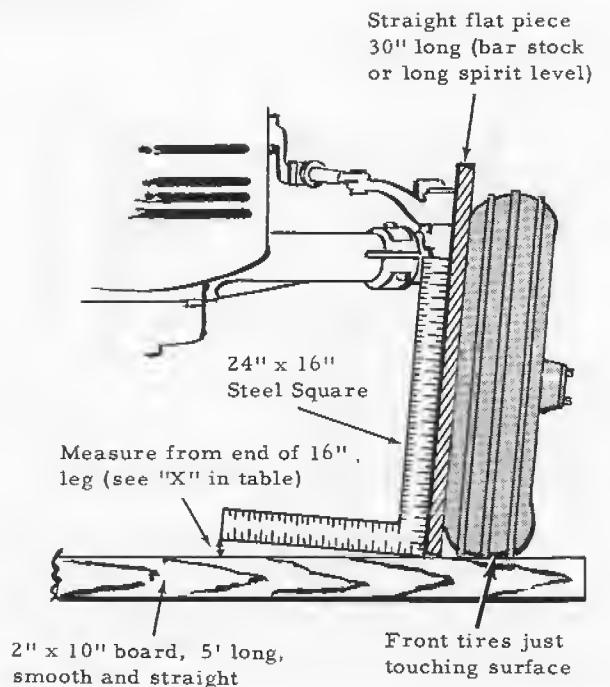
### Caster

The caster angle on this tractor is zero.

### Camber

The inclination of the front wheels outward from a vertical line through the point of ground contact is called camber. The wheels are farther apart at the top than at the bottom. The sketch, Illust. 2, shows an ideal condition where the center line of the steering knuckle pivot pin passes through the point of ground contact. Actually, such ideal condition is not attained because of tire crush and other factors. Without camber angle the wheels would roll in an arc when the pivot pin turned. Correct camber angle is 2-1/2 degrees.

Camber angle can be corrected in the field only by locating and replacing bent parts. A suggested method of checking camber is shown in Illust. 3. Tools required are a carpenter's square 16" x 24", a metal straight edge 30" long, a 6" scale, and a jack. Measurements should always be taken with the wheels in the straight ahead position. Jack up the tractor and lower until both tires just touch a smooth straight board without any crushing.



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Illust. 3. Method of checking front wheel camber.

When measurement X is:	Camber Angle is:
1/2" -----	1° 30'
11/16" -----	2° 30'
31/32" -----	3° 30'

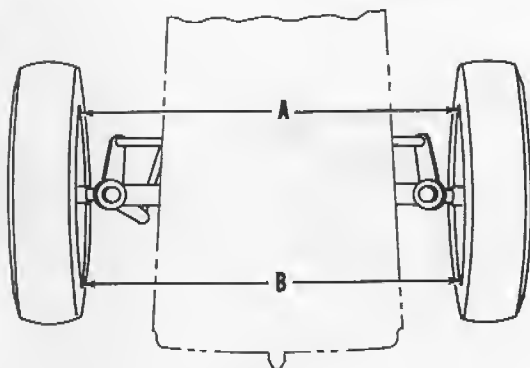
Note: Take average of three measurements on each wheel, rotating wheel 120° each time.

### Toe-in

The front wheels are adjusted so that they are closer together at the front than at the rear. The amount of toe-in can be measured as shown in Illust. 4. A minus B must be .030 to .130 inches. It is important to measure the same point, at hub height, in both the rear and forward positions. This will eliminate any error caused by tire bulges or bent rims. Toe-in is always checked when the wheels are in a straight ahead position.

### Preliminary Check-up

Whenever confronted with a problem of hard steering, establish test conditions under which you can check steering operation. The fact that these test operating conditions



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Illust. 4. Front wheel toe-in as seen from above.

are seldom found in the field is not a factor in checking a mechanism for correct specifications. Field operation naturally will be more difficult, but a tractor checked under the test conditions listed below will have correct steering efficiency under field conditions.

1. Lubricate the entire steering mechanism.
2. Have the tractor on a smooth, hard floor.
3. Check for correct tire inflation.
4. Make sure toe-in is properly adjusted.

If, after establishing the above test conditions, the steering problem still exists, systematically check all points of the steering mechanism for fit, alignment, and adjustment, as indicated by the following check list.

1. Proper location of steering arms and knuckle arms.
2. Wear on pivot pins (with tractor jacked up).
3. Bent or sprung linkage.
4. Fit and alignment of axle with axle extensions.
5. Ball bracket tightness and fit with the ball.
6. Gear backlash with steering gear in mid-position.

All of the above items should be checked before you remove the steering gear from the tractor. Disassembly, inspection and

repair of the various parts follow, if your preliminary inspection indicates need for overhaul. For details, refer to the applicable listings on the contents page of this manual.

## Clutch and Brake

The clutch is a four and one-half inch spring loaded, double plate, dry disc type and is connected to the engine by a "V" belt.

The brake is a double acting, contracting band located on the left rear axle.

The clutch and brake are operated by the same foot control, located on the left side of the tractor.

## Reduction Drive

The reduction drive is located ahead of the transmission case. The reduction drive shaft is supported by ball and needle bearings.

## Transmission

Sliding spur gears are positioned on a one piece transmission-input shaft and mate with spur gears mounted on a one piece countershaft with bevel pinion. Shafts are mounted in ball, roller and needle bearings. Gears have crowned induction hardened teeth with rounded edges for ease of shifting and long life. Reverse idler gear is mounted on a separate shaft.

## Differential

Two pinions and two side gears of carburized, hardened alloy steel are mounted on differential and pinion shafts in a one piece cast iron carrier case. The bevel gear is riveted to this same case. Entire carrier case is mounted in tapered roller bearings which are pre-loaded to reduce deflection of the bevel gear when placed under a load.

## Rear Axles

The rear axle shafts are splined on their inner end where they are supported and driven by the differential side gears. The outer end is supported by a bronze bushing located in the axle carrier. A flange is welded to the outer end to receive the rear wheels.

# SPECIFICATIONS

## Steering

Type .....	Cam and lever
Bearings .....	Ball

## Front Wheels

Bearing	
Type .....	Plain bushing
Length .....	1.156 ± .010 in.
I. D. ....	.880 to .885 in.
O. D. ....	1.380 to 1.383 in.
Bore for bushing .....	1.375 to 1.378 in.
Toe-in .....	.030 to .130 in.
Camber angle .....	2-1/2°
Caster angle .....	0°
Torque (Front wheel retaining cap screw) .....	56 to 63 ft. lbs.

## Front Axle

Spindle O.D. ....	.880 to .885 in.
Pivot tube	
Length .....	2.785 to 2.790 in.
I. D. ....	.580 to .622 in.
O. D. ....	.830 to .840 in.
Bore in axle for pivot tube .....	.842 to .844 in.
Bore for steering knuckle .....	.876 to .878 in.
Steering knuckle O.D. ....	.873 to .874 in.

## Tire Size

Front .....	4.80/4.00 - 8
Rear .....	6.00 - 12

## Clutch

Double plate, dry disc, spring loaded .....	4.5 in.
Clutch shaft	
Length, overall .....	21.06 ± .030 in.
O.D., except pilot end .....	.623 to .625 in.
O.D., pilot end .....	.370 to .375 in.
I. D., for spirol pin at rear of shaft .....	.124 to .129 in.
I. D., for two spirol pins at front of shaft .....	.185 to .192 in.
Clutch shaft sleeve	
Length .....	1.500 in.
I. D. ....	.631 to .635 in.
O.D., at small end .....	.997 to .999 in.
O.D., at large end .....	1.570 ± .010 in.
Flange thickness .....	.18 ± .030 in.
Clutch release collar	
I. D., small end .....	1.1240 to 1.1255 in.
I. D., large end .....	1.600 ± .010 in.
Length, overall .....	1.31 ± .030 in.
Release collar bushing	
Length .....	.745 to .755 in.
I. D. ....	1.000 to 1.001 in.
O. D. ....	1.127 to 1.128 in.

<b>Pressure plate carrier</b>	
Number of teeth . . . . .	10
Pressure angle . . . . .	30°
I. D. . . . .	.626 to .629 in.
Width . . . . .	.500 ± .030 in.
Bore for spirol pin . . . . .	.200 to .205 in.
<b>Clutch shaft pulley</b>	
O. D. . . . .	5.620 ± .010 in.
I. D. . . . .	.8745 to .8755 in.
<b>Clutch shaft pulley bushing</b>	
Type . . . . .	Oil lite
O. D. . . . .	.877 to .878 in.
I. D. . . . .	.626 to .627 in.
Length . . . . .	.870 to .880 in.
<b>Clutch loading spring</b>	
Free length . . . . .	6.70 in.
Test length . . . . .	5.18 in.
Test load . . . . .	236.36 lbs.
<b>Clutch release spring</b>	
Free length . . . . .	.442 in.
Test length . . . . .	.370 in.
Test load . . . . .	50.7 lbs.

**Brake** . . . . . External contracting

#### **Reduction Drive**

<b>Shaft and gear</b>	
Length, overall . . . . .	3.915 ± .010 in.
Shaft diameter at oil seal surface . . . . .	.745 to .752 in.
Shaft diameter at front bearing surface . . . . .	.7873 to .7878 in.
Shaft diameter at rear bearing surface . . . . .	.8745 to .8750 in.
Number of teeth . . . . .	13
Backlash with mating gear . . . . .	.0016 to .0053 in.
<b>Driven reduction gear</b>	
O. D. . . . .	4.745 to 4.750 in.
Number of teeth . . . . .	56
Backlash with mating gear . . . . .	.0016 to .0053 in.
<b>Driven reduction gear spacer</b>	
Length . . . . .	1.144 ± .010 in.
O. D. . . . .	1.50 ± .030 in.
I. D. . . . .	.979 to .986 in.

#### **Rear Axle Carrier**

Type . . . . .	One piece, cast grey iron
Bore for axle bushing . . . . .	1.1245 to 1.1255 in.

#### **Rear Axle Bushing**

Material . . . . .	Steel back, bronze lining
Length . . . . .	.740 to .760 in.
I. D. (after assembly) . . . . .	1.001 to 1.004 in.

#### **Rear Axles**

Diameter at bushing location . . . . .	.9970 to 1.0000 in.
Torque (Rear wheel retaining cap screws) . . . . .	56 to 63 ft. lbs.



## Transmission

Type .....	Selective, sliding spur gear
Gears forward .....	3
Gears reverse .....	1
Ground speeds (full load at 3600 rpm) (6-12 rear tires)	
1st Gear .....	2.288 mph
2nd Gear .....	3.051 mph
3rd Gear .....	6.864 mph
Reverse .....	2.550 mph
Case (Transmission-Differential) .....	One piece, cast iron
Bore for front transmission input shaft bearing .....	1.8503 to 1.8509 in.
Bore for rear transmission input shaft bearing .....	1.1245 to 1.255 in.
Countershaft front bearing retainer O.D. ....	2.218 to 2.219 in.
Bore for front countershaft bearing retainer .....	2.2195 to 2.2215 in.
Bore in retainer for bearing .....	2.0470 to 2.0478 in.
Bore for rear countershaft bearing .....	2.4392 to 2.4399 in.
Countershaft (with integral pinion)	
Diameter at front bearing location .....	.7873 to .7876 in.
Diameter at rear bearing location .....	1.1803 to 1.1808 in.
Transmission input shaft	
Diameter at front bearing location .....	.9842 to .9846 in.
Diameter at rear bearing location .....	.8095 to .8099 in.
Reverse idler gear bushing (running clearance on shaft) .....	.0020 to .0035 in.
Reverse idler gear shaft diameter .....	.610 to .611 in.
Bearings	
Countershaft front .....	Ball
Countershaft rear .....	Roller
Transmission input shaft front .....	Ball
Transmission input shaft rear .....	Needle roller
Countershaft gear and bearing spacer lengths:	
1. Between front bearing and 3rd speed driven gear .....	.848 to .852 in.
2. Between 3rd speed driven gear and 2nd speed driven gear ...	1.310 to 1.314 in.
3. Between 2nd speed driven gear and 1st speed driven gear ...	.310 to .314 in.
4. Between 1st speed driven gear and reverse driven gear .....	.686 to .690 in.
5. Between reverse driven gear and rear bearing .....	.690 to .694 in.

## Differential

Type .....	Bevel gears and pinions
Number of pinions .....	2
Case (carrier) .....	One piece, cast iron
Bearings (two) .....	Tapered roller
Bearing adjustment (pre-load) .....	1.5 to 8.0 in. lbs.
Adjusting shims .....	.004-.007-.015-.030 in.
Hub diameter for bearing location .....	1.375 to 1.376 in.
Bore in carrier case for pinion shaft .....	.6875 to .6880 in.
Pinion shaft diameter .....	.6870 to .6875 in.
Pinions (number of teeth) .....	10
Pinion to shaft clearance .....	.0025 to .0050 in.
Bore in carrier case for side gear hub .....	1.252 to 1.254 in.
Side gears (2) (number of teeth) .....	16
Side gear hub, diameter .....	1.248 to 1.250 in.
Bevel gear and pinion (backlash) .....	.003 to .005 in.
Adjustment by shims .....	.004-.007-.015-.030 in.
Bevel gear location .....	On differential case
Pinion location .....	Integral part of transmission countershaft
Gear reduction ratio .....	10/46
Differential bearing retainer O.D. (at transmission case bore location)	3.372 to 3.374 in.

# STEERING ASSEMBLY

## Removal

Note: If tractor is not equipped with electric starting, disregard the first three steps.

1. Disconnect and remove the battery.
2. Disconnect the armature and field wire from the generator.
3. Disconnect the ignition wire at the coil.
4. Disconnect the throttle and choke controls.
5. Remove the steering wheel with a

three jaw puller, felt seal, and upper steering column bearing.

6. Disconnect the drag link from the steering arm.

7. Remove the four cap screws securing the instrument panel to the frame and remove the instrument panel.

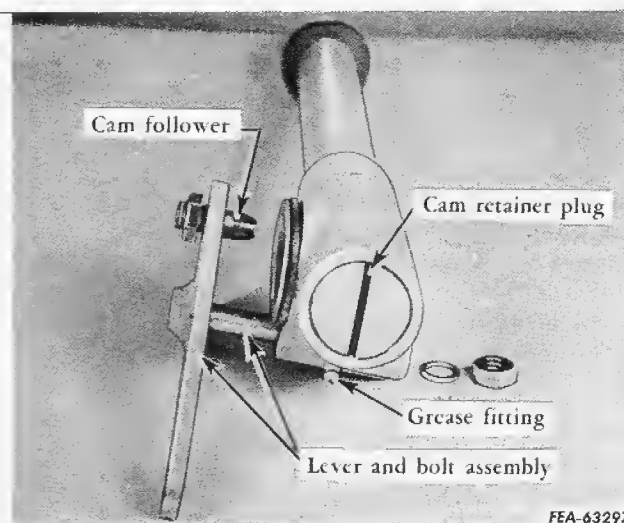
8. Remove the two cap screws securing the steering column to its mounting bracket, and remove the complete steering column assembly. (Illust. 5.)

## Disassembly

1. Remove the lock nut and washer from the lever and bolt assembly and remove the assembly. (Illust. 6.)
2. Remove the bearing retainer from the bottom end of the steering column.
3. Tap the end of the steering cam against a wooden block to remove the cam assembly from the steering column.
4. Remove the retaining rings holding the bearing races and ten ball bearings in each race to the steering cam.



Illust. 5. Removing steering column assembly.

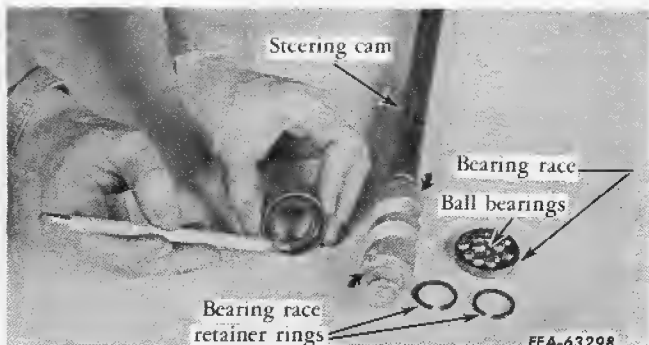


Illust. 6. Lever and bolt assembly partially removed from the steering assembly.

## Inspection and Repair

Wash all parts in solvent and dry thoroughly.

1. Inspect the cam follower for wear and replace if necessary.



Illust. 7. Steering gear cam assembly and bearings. The races indicated by pencil and arrows should be inspected for brinelling and roughness.

2. Inspect the cam, bearings, and bearing races for wear, roughness or pitted balls. Inspect the cam grooves for wear, roughness or galling. Illust. 7. A worn cam will require replacement of the cam-tube assembly.

3. Check the steering gear cam housing for cracks and replace if necessary.

4. Check the upper bearing for wear or roughness, replace if necessary.

## Reassembly and Adjustment

Reverse the order of disassembly, paying particular attention to the following steps.

1. When installing the cam in the steering housing, be certain that the bearing caps do not bind in the steering housing.

2. When installing the bearing retainer plug in the bottom of the steering housing, tighten sufficiently to remove any end play and stake the retainer to prevent it from loosening up.

3. Before installing the lever and bolt assembly, fill the housing with grease. (Refer to the Operator's Manual for amount and type.)

4. When adjusting the cam follower, be sure the steering gear is in its center position. To check this, install the steering wheel temporarily and turn it from extreme left to right counting the number of turns; then return the wheel one half this number to locate the mid-position. Turn the cam follower screw in until zero backlash is obtained and tighten the lock nut.

5. Remove the steering wheel and install the unit on the tractor. Continue reassembly in the reverse order of disassembly.

6. The electrical system (if equipped) does not have to be polarized since the system is automatically polarized when the starter button is pressed.

# FRONT WHEELS AND BUSHINGS

## Removal and Disassembly

1. Block the rear wheels, jack up the front end of the tractor and support it on a suitable jack stand.
2. Thoroughly clean the exterior of the wheel and wheel hub.
3. Remove the cap screw and washer securing the front wheel and hub to the axle.
4. Remove the wheel, wheel hub and wheel bushings. All of these come off as an assembly without the use of a puller.
5. Wash the bushing bore in a clean solvent and dry with compressed air.
6. If it is necessary, the wheel bushings can be driven out by using a hammer and a suitable drift punch. Drive from the inside toward the outside.

## Inspection and Repair

1. Check the wheel bushing diameter with a telescoping gauge and a micrometer. Refer to specifications for size of new part.
2. Check the front axle with a micrometer. Refer to specifications for size of new part. Replace if necessary.

## Reassembly

If they were removed install the front wheel bushings. Press in the bushings until the flange on the bushing is against the wheel hub.

Note: Be certain to align the groove in the bushing with the grease fitting.

## Installation

Installation is the reverse of removal. After installation grease the wheels through the grease fitting.

# FRONT AXLE

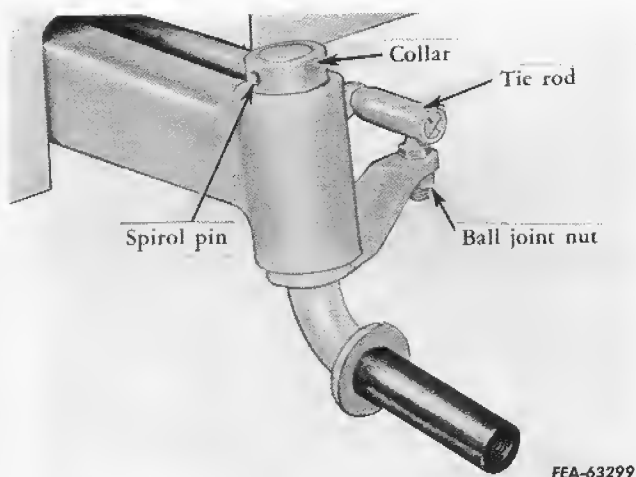
## Steering Knuckle Removal

1. Place a jack or support at the front end of the tractor chassis.
2. Remove the cap screw and washer securing the wheel to the axle spindle and remove the wheel assembly.
3. Remove the hex nuts securing the tie rod ball joint assemblies to each axle steering arm. (Illusts. 8 and 9.)
4. Disconnect the tie rod ball joint from the axle steering knuckle arms and remove the tie rod.
5. Right front steering knuckle only: Remove the hex nut securing the drag link ball joint (Illust. 9) to the steering knuckle arm and disconnect the ball joint from the arm.

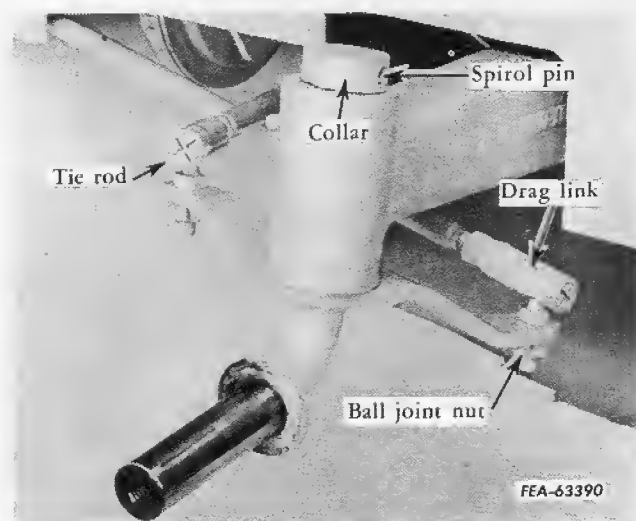
6. Drive out the spirol pin (Illusts. 8 and 9) from the steering knuckle collars and remove the knuckles from the axle.

## Removal of Front Axle

1. Remove the four cap screws securing the shield (if equipped) to the chassis and remove.
2. Place a support under the tractor frame behind the front axle.
3. Remove the axle pivot pin nut and lockwasher. (Illust. 10)
4. Remove the axle pivot pin bolt. (Illust. 11.)
5. Remove the axle and pivot pin from the chassis.



Illust. 8. Components of the left front axle steering knuckle assembly.



Illust. 9. Components of the right front axle steering knuckle assembly.

6. Remove the pivot pin from the axle. (Illust. 11.)

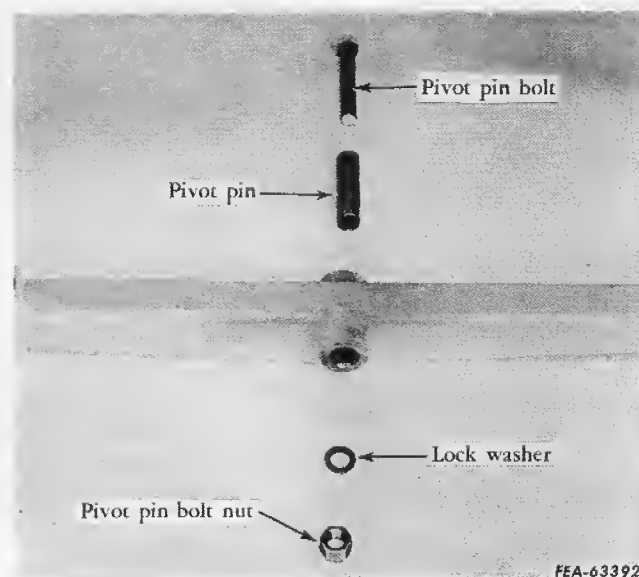
### Inspection and Repair

All parts of the front axle assembly should be visually inspected for proper shape and alignment. This may be difficult to do unless new parts are available for comparison. However, since both the right and left sides of the assembly are symmetrical, some comparison is possible and most distortion can be seen. Bent parts frequently effect the steering geometry and hard steering results.

1. Inspect all parts closely for wear or



Illust. 10. Axle pivot pin nut.



Illust. 11. Pivot pin components.

breaks. Refer to Specifications for size of new parts.

2. Check the steering knuckle pivot pin bearing surfaces as shown in Illust. 12. Also inspect the mating bearing surfaces of the steering knuckle pivot pin as shown in Illust. 13.

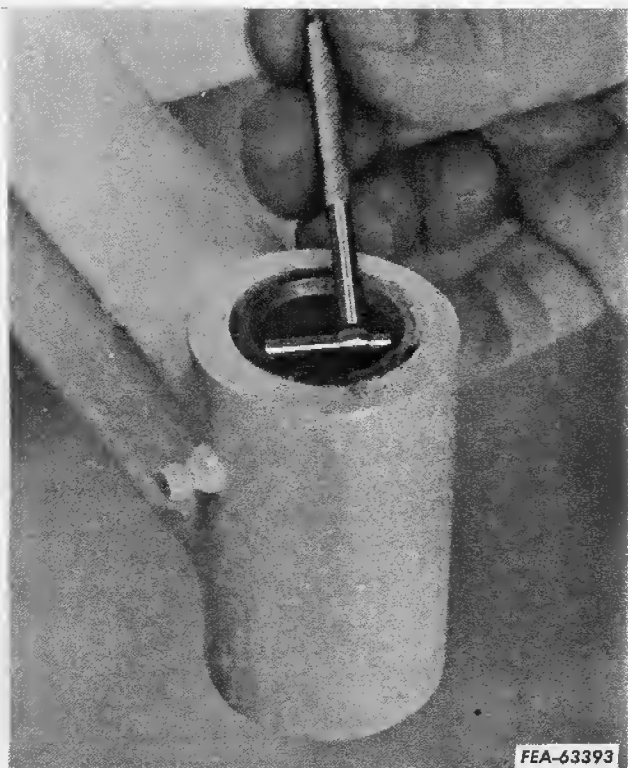
3. Inspect the front axle pivot pin bearing surface, using a telescoping gauge.

4. Inspect the tie rod and drag link rod ball joint for wear or breaks.

### Reassembly

#### Front Axle

1. Apply grease liberally to the pivot pin and the pivot pin bearing surface in the axle.



Illust. 12. Checking steering knuckle pivot pin bearing surface with a telescoping gauge.

2. Install the pivot pin in the axle and install the axle to the tractor chassis.

3. Install the pivot pin bolt, lockwasher and hex nut.

### Steering Knuckles

1. Place a jack or support at the front end of the tractor and remove the support under the panel housing support.

2. Apply grease liberally to the steering knuckle pivot pin and install the pin in the axle bore.



Illust. 13. Checking steering knuckle pivot pins with a micrometer.

3. Install the steering knuckle collar.

4. Install the spirol pin through the collar and the pivot pin.

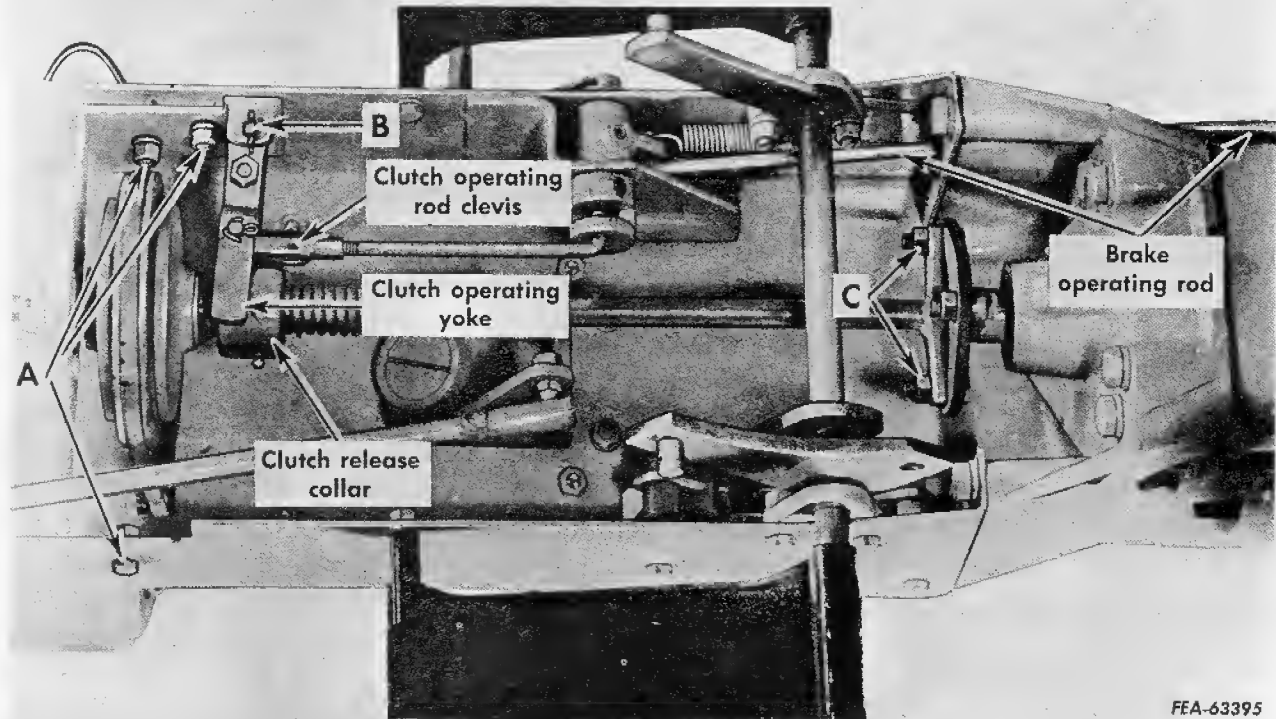
5. Install the tie rod ball joint assemblies to the steering knuckle arms and secure the assemblies with the hex nuts.

6. Right hand steering knuckle only: Install the drag link ball joint assembly to the steering knuckle arm as shown in Illust. 9.

7. Install the wheels on the axle spindles and secure with cap screws and washers.

8. Remove the jack or support from the tractor.

# CLUTCH



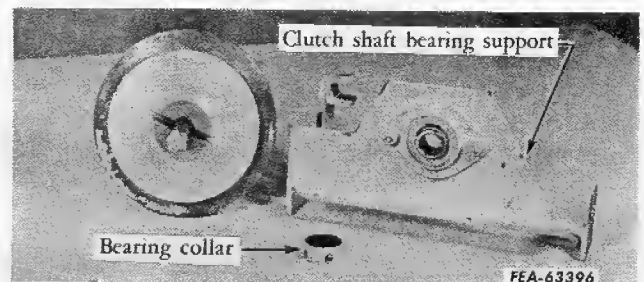
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Illust. 14. View of underside of tractor showing clutch disconnect points.

## Removal (Refer to Illust. 14.)

1. Remove the three bolts "A" from the drive shaft bearing support, remove the cotter pin and pin "B" and the two cap screws "C".

2. Remove the drive belt from the engine pulley, then slide the complete unit forward until the rear end of the clutch shaft is out of its pilot hole in the reduction drive shaft coupling. Then lower the complete unit until it can be removed from the tractor.



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Illust. 15. Bearing support and collar removed from the clutch shaft.

## Disassembly

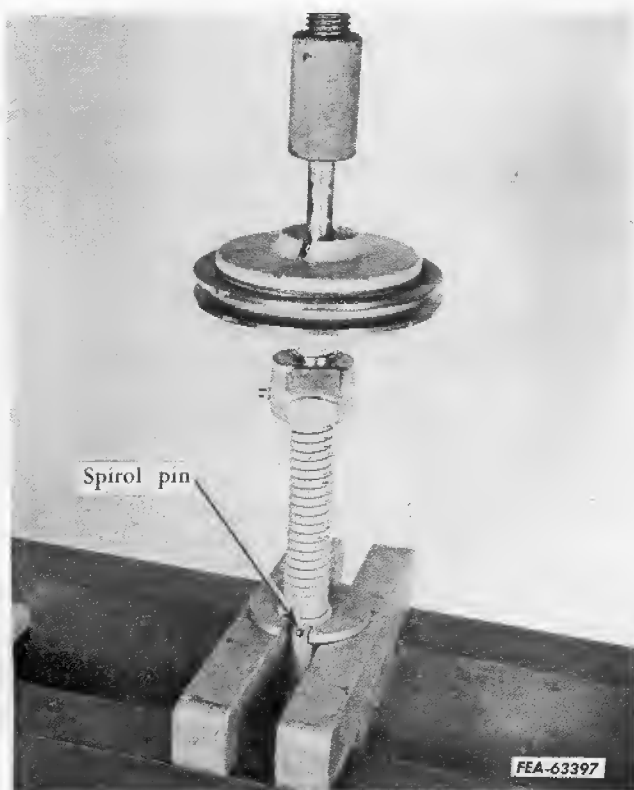
1. Loosen the set screw in the bearing collar, remove the collar and clutch shaft bearing support from the shaft. (Illust. 15.)

2. Place the shaft assembly in a press. Using slotted washer FES 10-3 Illust. 16, compress the clutch loading spring until

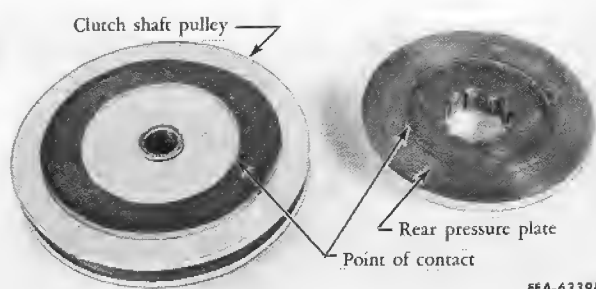
the  $1/8 \times 7/8$  inch spirol pin can be driven out. Release the press slowly until the clutch loading spring is fully expanded.

3. Slide the rear pressure plate to the rear of the clutch shaft and drive out the remaining two spirol pins. All parts can now be removed from the clutch shaft.





Illustr. 16. Clutch loading spring compressed.



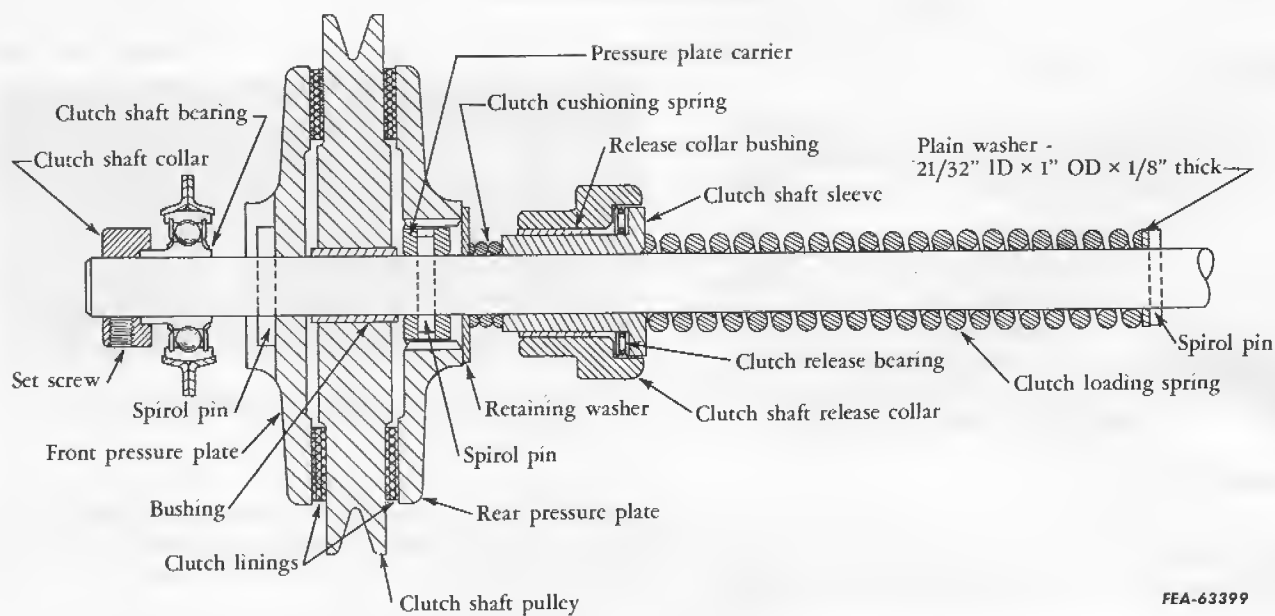
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Illustr. 17. Check surfaces indicated for metal to metal contact.

### Inspection and Repair

Refer to specifications for size of new parts.

1. Wash all parts, except the clutch linings in cleaning solvent and dry with compressed air.
2. Check the clutch loading and clutch release springs to see if they are within specifications.
3. Check the bushings to see if they are excessively worn or out of round.



FEA-63399

Illustr. 18. Cross section of spring loaded clutch



4. Check both bearings for pitting or roughness of operation. Replace if necessary.

5. Check the clutch linings to see if they are excessively worn. Linings should be replaced when the surfaces indicated in Illust. 17 shows evidence of metal to metal

contact. Rear pressure plate shown. Also check the front pressure plate.

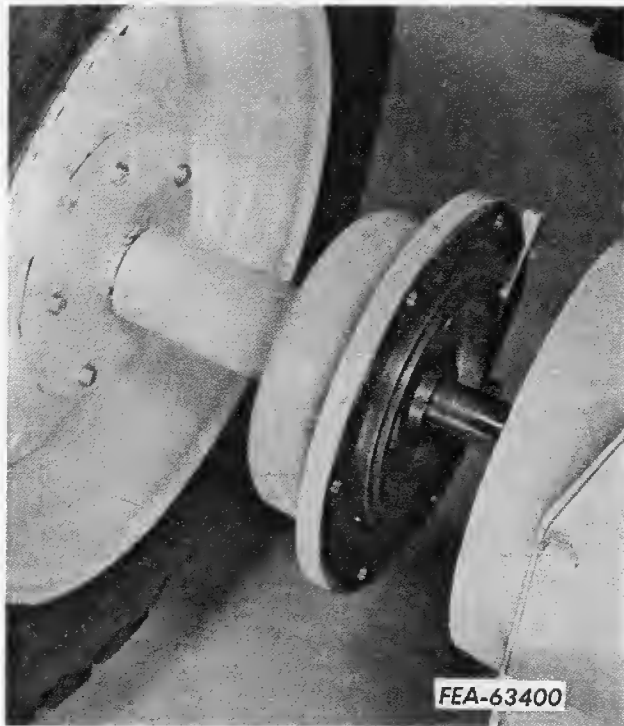
### Reassembly

Reverse the order of disassembly. Refer to Illust. 18 for the proper placement of part on the clutch shaft. For clutch adjustment refer to page 20.

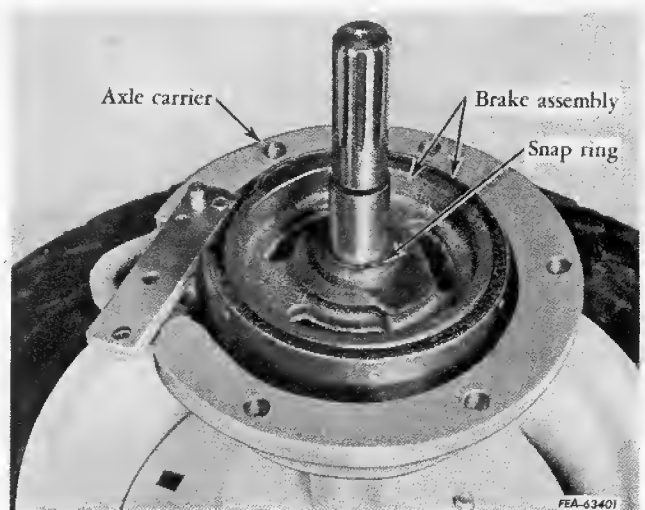
## BRAKE

### Removal

1. Support the rear end of the tractor.
2. Remove the cotter and the clevis pin from the brake toggle assembly arm, and the brake rod clevis.
3. Remove the cap screws securing the carrier to the transmission case.
4. Remove the carrier, brake, axle and wheel as a unit from the tractor. (Illust. 19.)



Illust. 19. Removing the axle, axle carrier and brake assembly.



Illust. 20. Components of the left rear axle.

### Disassembly (Refer to Illust. 20.)

1. Remove the rear axle snap ring.
2. Remove rear axle collar.
3. Remove the brake drum and lining assembly from the axle.
4. Remove the rear axle carrier from the axle.
5. Slide the brake band assembly from the brake drum.
6. Remove the brake band pivot pin and anchor pin.

### Inspection and Repair

Greatest braking efficiency can be ob-

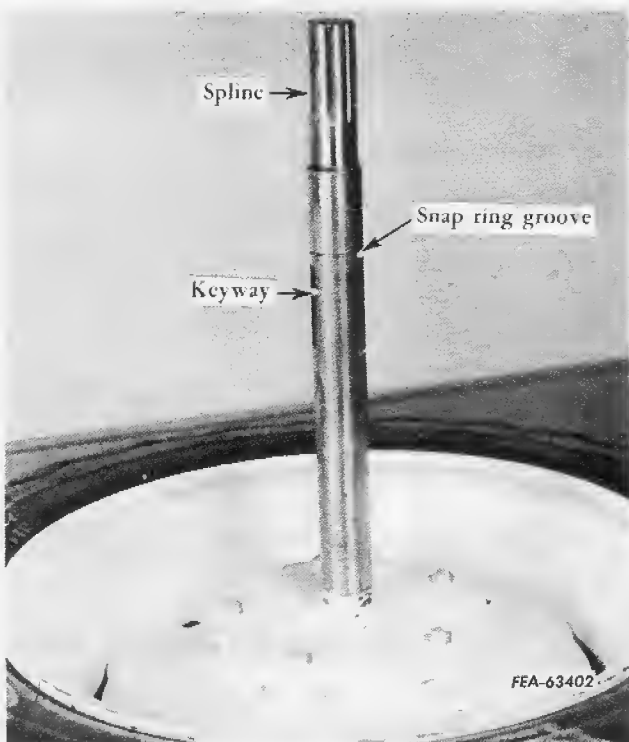
tained only when the maximum amount of friction area makes contact during the braking action. For this reason, braking surfaces that are rust pitted have lost some braking efficiency; the pitted area will not contact the friction material of the brake lining. The amount of efficiency lost will depend on the extent of the pitting.

Grooved brake lining caused by rough or rust encrusted brake surfaces also can result in a great reduction in the lining area that contacts the brake surface. Inspect thoroughly and take corrective action as necessary, using the following steps and procedures as your guide.

1. Wash all parts except the brake lining in a clean solvent and dry out with compressed air.

2. Inspect the brake lining and brake drum for excessive grooving, rust or rust pitting. Clean all traces of rust from the brake surface with a wire brush and emery cloth. Excessively grooved or pitted lining and brake drums should be discarded.

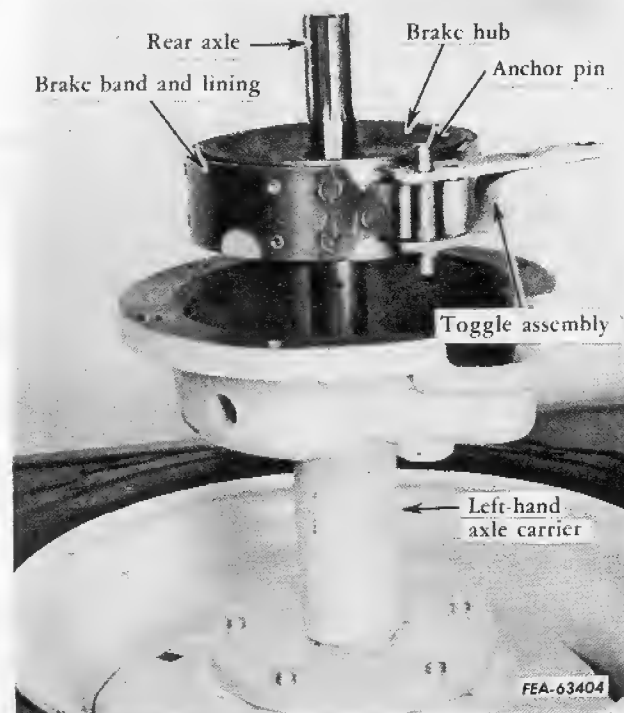
3. Check keyway in the rear axle by inserting a new key. If the fit is loose the axle must be replaced.



Illust. 21. Rear axle.



Illust. 22. Rear axle carrier installed on axle.



Illust. 23. Brake drum and brake lining assembly partially installed.

4. Inspect the key removed from the assembly, for signs of wear. Replace if in doubt.

5. Inspect the toggle assembly, anchor pin, and pivot pin. Replace if necessary.

6. Inspect the rear axle spline and snap ring groove for wear, Illust. 21.

7. Inspect the rear axle carrier and axle bushing for wear. Replace if necessary.

## Reassembly

1. If they were removed, install the

brake band pivot pin and the brake band anchor pin.

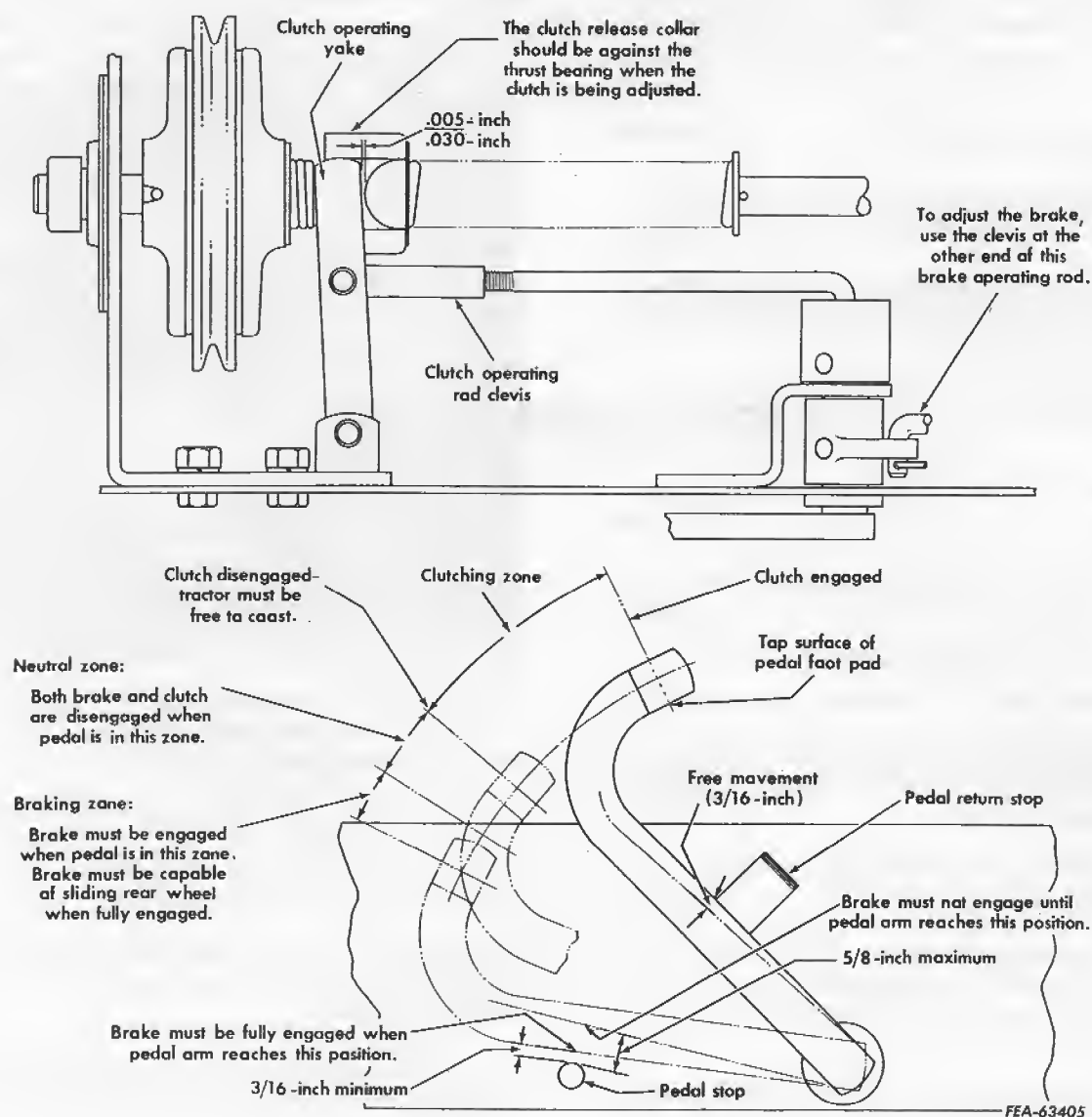
2. Install the brake lining assembly to the brake drum.

3. Install the rear axle carrier to the axle Illust. 22.

4. Install the Woodruff key to the axle.

5. Install the brake drum and brake lining assembly to the axle Illust. 23.

6. Install the axle collar and snap ring.



Illust. 24. Brake and clutch adjustment diagram.

## Installation

1. Install the carrier, brake, axle and wheel as a unit to the transmission case. Be careful not to damage the oil seal in the differential bearing retainer.

2. Secure the axle carrier to the transmission case with the cap screws.

3. Install the clevis pin and cotter pin to the brake rod clevis and toggle assembly arm.

## Clutch and Brake Adjustment

The clutch and brake are both operated by the same pedal, therefore, care must be taken to maintain a neutral zone so that the clutch is disengaged when the brake is applied.

### Adjusting the Clutch (Refer to Illust. 24)

It is important that a clearance of .005 to .030 inch be maintained between the lug on the clutch release collar and the clutch operating yoke. In order to maintain this clearance, the pedal should not have a free

movement of more than 3/16 inch. When it is necessary to adjust the clutch, turn the clevis on the clutch operating rod in or out as required to get the above measurement.

### Adjusting the Brake (Refer to Illust. 24)

The brake band should take hold on the brake drum when the brake pedal arm is pressed down within a maximum distance of 5/8 inch and a minimum distance of 3/16 inch above the top of the pedal stop on the left foot support.

To adjust the brake, turn the clevis on the brake operating rod (at the brake drum) in or out as required to get this measurement.

Note 1: In order to maintain a definite neutral zone between disengagement of the clutch and engagement of the brake, be sure the brake does not take hold before the pedal arm is within the maximum distance of 5/8 inch above the foot support pedal stop.

Note 2: Sometimes it is difficult to obtain a neutral position until the brake has been applied a few times.

# REDUCTION DRIVE

## Removal

To service, the reduction drive requires splitting the tractor just forward of the reduction drive housing.

1. Drain the oil from the transmission.

2. Disconnect the brake rod from the brake actuating arm on the left side of the transmission.

3. Disconnect the flexible coupling from the reduction drive yoke.

4. Support the front of the tractor with a suitable stand. Support the rear section of the tractor at the forward part of the transmission.

5. Remove the four cap screws securing the reduction drive housing to the front part of the tractor and roll the rear section away from the front section.

6. Remove the four cap screws securing the reduction drive housing to the transmission and remove the reduction drive complete. (Illust. 25.)

## Disassembly

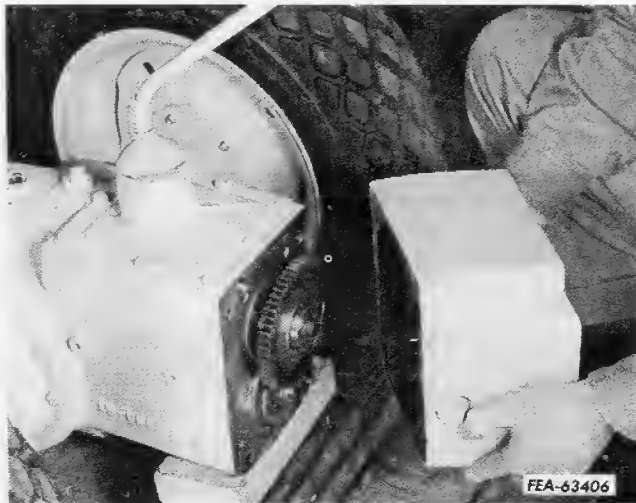
1. Pry out the reduction shaft oil seal with a screwdriver.

2. Remove the reduction drive shaft snap ring. Illust. 26. Using a hydraulic press, press the reduction drive shaft out of the reduction drive housing.

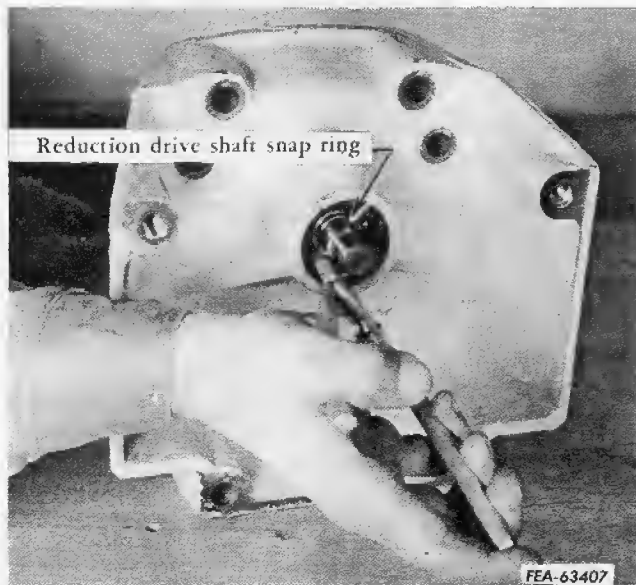
Caution: The oil seal and snap ring must be removed before pressing out the reduction drive shaft.

3. If necessary to remove the front reduction drive shaft bearing proceed as follows:

a) Remove the internal snap ring.



Illust. 25. Reduction drive housing removed.



Illust. 26. Removing the reduction drive shaft snap ring.

b) Using a slide hammer and bearing puller, remove the bearing.

4. The reduction drive shaft rear bearing can also be removed by using a slide hammer.

### Inspection and Repair

1. Wash all parts in a cleaning solvent and dry with compressed air.

2. Inspect the bearings for roughness of operation, pitted condition, or flat spots. Replace bearings if necessary.

Note: All bearings that are to be re-used should be oiled and wrapped in oilproof paper until ready for reassembly.

3. Check the reduction drive shaft for excessive wear. Refer to specifications for size of a new shaft.

### Reassembly

Caution: Make sure both snap rings have been installed before replacing the drive shaft oil seal.

1. If it was removed install the reduction drive shaft rear bearing.

2. If it was removed install the reduction drive shaft front bearing and the internal snap ring.

3. Using a press, install the reduction drive shaft.

4. Install the reduction drive shaft snap ring.

5. Install the reduction drive shaft oil seal.

6. Mount the reduction drive housing unit to the transmission case and recouple the tractor.

# REAR AXLES

## Removal

1. Remove the cotter and clevis pin from the brake toggle assembly on the left rear axle.
2. Support the rear of the tractor and remove the cap screws securing the axle carriers to the transmission case.
3. Remove the carriers with the axles from the transmission case.
4. To remove the left axle from the axle carrier proceed as follows.
  - a) Remove the axle shaft snap ring.
  - b) Remove the brake assembly and collar.
  - c) Remove the Woodruff key.
  - d) Remove the axle from the carrier.
5. To remove the right axle from the carrier remove the snap ring and collar, then remove the axle from the axle carrier.

## Inspection and Repair

1. Wash the axle shafts, carriers, and bushings with a cleaning solvent and dry with compressed air.
2. Check the axles and axle bushings for excessive wear. Refer to specifications for size of new parts and replace as necessary.

3. Check the ends of axle shaft splines for burrs and excessive wear. Remove burrs with a fine stone.

4. Inspect the carriers for cracks, replace if necessary.

5. Inspect each axle shaft oil seal, located in differential bearing retainer. Replace as necessary.

## Reassembly

1. If the axle bushings were removed, install the new bushings.

Note: Be certain that the hole in the bushing lines up with the grease hole in the axle carriers.

2. Install the carrier, collar and snap ring to the right rear axle.

3. Install the following parts in sequence to the left rear axle:

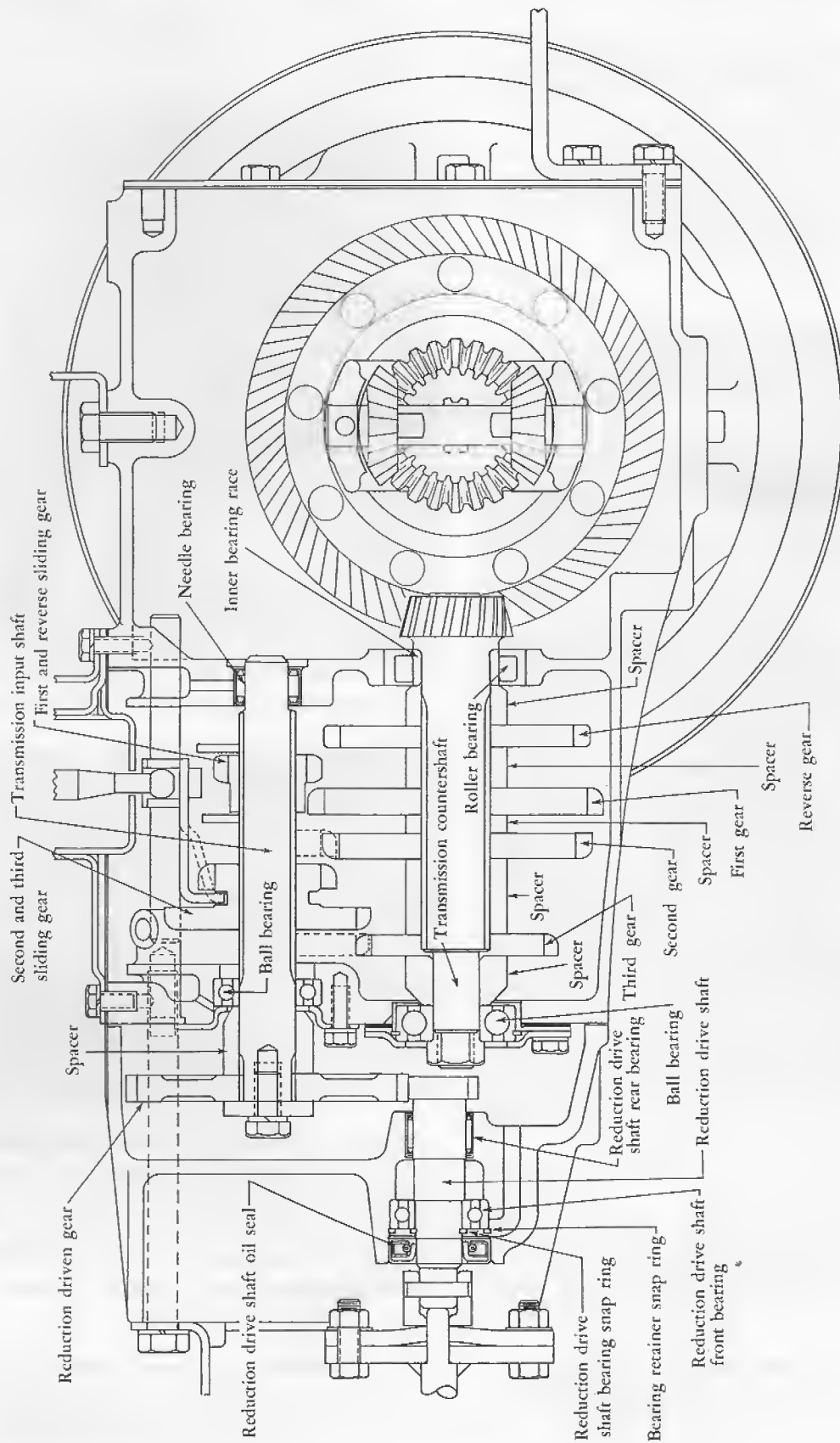
- a) The carrier
- b) The Woodruff key
- c) The brake assembly
- d) The collar
- e) The snap ring

4. Install the carriers with the axles to their respective places on the transmission case and secure the carriers to the transmission case with the cap screws.

# DIFFERENTIAL AND TRANSMISSION

To service the transmission only requires removing the reduction drive housing and the rear axle assemblies as previously outlined. Also the differential has to be removed before the transmission can be serviced. The differential can be removed

without disassembly of the transmission, but when checking preload on the differential bearings the transmission countershaft should be removed. Therefore, the differential and transmission are covered together. Refer to Illust. 27.



FEB-14010

Illust. 27. Cross section of transmission, differential, and reduction drive.



## Removal and Disassembly (Differential)

1. After the reduction drive housing and the rear axle carriers have been removed from the transmission case set the case on a suitable work bench.

2. Remove the three cap screws and bearing retainer from the differential on the left side of the transmission case.

Note: When the retainers are removed keep the shims with each retainer to aid in reassembly.

3. Remove the retainer from the right side of the transmission case.

4. The differential can now be removed from the transmission.

Note: The differential must be turned in a certain position before it can be removed from the transmission case. Illust. 28.

5. Drive out the differential lock pin.

6. Drive out the differential pinion shaft.

7. Rotate the differential side gears 90°, then the differential pinion gears and side gears can be removed. Illust. 29.

8. If the differential drive gear needs to be replaced, drive or press out the eight rivets.



Illust. 28. Removing differential from the transmission case.



Illust. 29. Differential partially disassembled.

## Disassembly (Transmission)

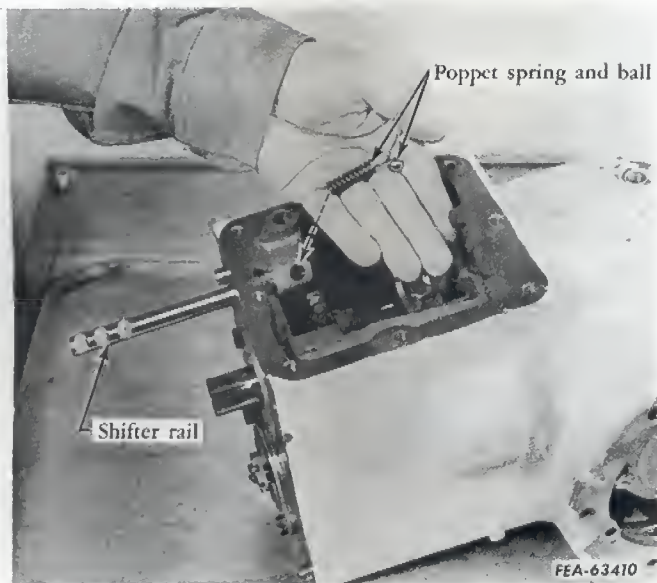
To service the transmission requires removing the differential and reduction drive housing as previously outlined.

1. Remove the reduction driven gear and spacer from the transmission input shaft.

2. Remove the gear shift mechanism from the top of the transmission housing.

3. Remove the two shifter fork set screws and drive the shifter rods out toward the front of the transmission.





Illust. 30. One shifter rail removed.



**Caution:** Cover the gear shift poppet ball hole in the transmission case as the rods are being removed. This is to prevent the ball and spring from flying out and possibly injuring the serviceman. Illust. 30.

4. Remove the three cap screws securing the transmission input shaft retainer to the transmission.

5. Pull the transmission input shaft forward and out of the transmission and remove the first and reverse speed gear and the second and third speed gear from the transmission.

6. Remove the cotter pin and countershaft nut.

**Note:** Save the shims to aid in reassembly.

7. With a soft driver, drive the countershaft to the rear of the transmission, noting the sequence of the gears and spacers on the countershaft.

8. Remove the cap screw securing the reverse idler gear shaft in the transmission. After the cap screw has been removed the shaft can be removed by hand. Refer to Specifications for reverse idler shaft O.D. and the reverse idler shaft bushing I.D.

## Inspection and Repair (Differential and Transmission)

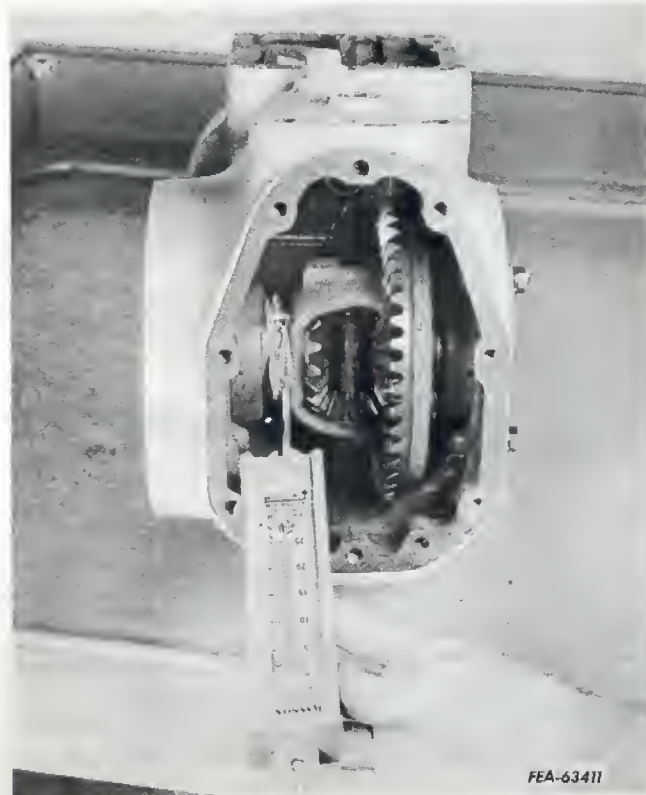
1. Wash all parts in cleaning solvent and dry with compressed air.

2. Check bearings before removing them from gear case. Replace as necessary.

3. Check gears and shafts for wear and burrs. Remove any burrs with a fine stone.

## Reassembly (Differential and Transmission)

For reassembly reverse the order of disassembly, paying particular attention to the following steps. Refer to Illust. 27 for proper placement of parts.



Illust. 31. Checking preload on the differential bearings.

1. If the transmission input shaft rear (needle) bearing is to be replaced, make sure that the oil hole on outer race of bearing is lined up with the hole in transmission case on reassembly.

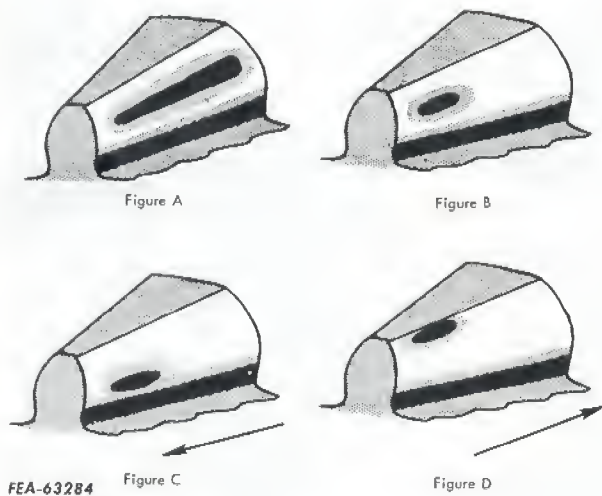
2. After the differential has been reassembled and before the transmission parts have been installed in the transmission case;

install the differential using the same shims that were removed and check the bearing preload as in Illust. 31. A pull of one to four pounds will give the correct preload. Add or remove shims until the correct preload is obtained.

**Note:** The differential case is installed with the gear to the right, teeth facing left.

3. Remove the differential and install the transmission countershaft, with gears and spacers, using the same shim pack that was removed.

4. Reinstall the differential and check the tooth bearing pattern of the bevel gear and pinion, as outlined below. Refer to Illust. 32.



Illust. 32. Tooth bearing patterns.

5. Apply a thin coating of red lead and oil paste to the bevel pinion teeth faces, and rotate the gears by hand. Areas where lead is removed during rotation indicate actual points of tooth bearing.

Some slight springing or deflection of the mating gears occur under operating load, since it is not practical or necessary to make their mounting assemblies absolutely rigid, allowance is made in gear design for displacement under operating loads to prevent concentrating the load on the tooth edges. Therefore in our hand rotated testing and under very light operating loads we will find an acceptable area of tooth contact will be localized toward the toe (small end) of the tooth as shown in Figure B. Then when deflection occurs under application of greater operating load the area of tooth contact will extend toward the heel (large end) of the tooth as shown in Figure A.

This desirable toe bearing secured under hand rotated (no load) test as shown in Figure B, is the result of adjusting the bevel gear lateral position within the specified range of .003" to .005" backlash.

The position of the tooth bearing from the base to the peak of the tooth is controlled by lateral position of the pinion. Given a low bearing on the bevel pinion tooth as shown in Figure C, the pinion must be adjusted to mesh deeper into the bevel gear to center the area of contact between the base and peak of the tooth. Given a high bearing on the bevel pinion tooth as shown in Figure D, the pinion must be adjusted to mesh more shallow into the bevel gear for correction. Where it is found necessary to move the pinion in or out of mesh to correct base to peak tooth bearing, the bevel gear must also be shifted laterally in order to maintain the specified backlash.

6. Continue reassembly in the reverse order of disassembly.

7. After reassembly has been completed add oil of the correct type and amount as specified in the Operator's Manual.

## 1

[illegible]



**1<sup>st</sup> in service**